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**Project 519**

**October 2003**

## **PM<sub>10</sub> RESEARCH FOR DEVELOPING EDUCATIONAL TOOLS AND OUTREACH PROGRAMS**

### **Introduction**

Maricopa County residents and jobs have more than doubled in twenty years, and daily vehicle travel has nearly tripled over this period. Unprecedented levels of residential construction have also occurred. Both the increased vehicle mileage and the construction activity have contributed to levels of particulate matter and other air pollutants that have periodically exceeded the National Ambient Air Quality Standards (NAAQS) established by the Environmental Protection Agency (EPA).

The urbanized portion of Maricopa County was designated a moderate non-attainment area for particulate matter less than ten microns in diameter (PM<sub>10</sub>) by the 1990 Clean Air Act Amendments. Despite several attempts by the Arizona Department of Environmental Quality (ADEQ) and the Maricopa Association of Governments (MAG) to implement a PM<sub>10</sub> plan that would bring the area into compliance, which were complicated by law suits, the nonattainment area was re-designated to Serious in 1996.

In February 2000, MAG submitted a Serious Area PM<sub>10</sub> Plan to the EPA that shows attainment of the standards by December 31, 2006, based on implementation of more than 80 committed control measures. The Plan indicates that 43 percent of PM<sub>10</sub> emissions in 1995 were from sources such as construction/earthmoving dust, construction trackout, non-road engine exhaust, and construction windblown dust. Most of the control measures contained in the Serious Area PM<sub>10</sub> Plan address control of fugitive dust from these sources and were implemented through the enactment of Maricopa County Rule 310.

### **Research Objectives**

In response to a directive from the 1998 Governor's Brown Cloud Summit, the Arizona Department of Transportation (ADOT) sponsored this research in order to assist affected jurisdictions in the nonattainment area in increasing construction industry awareness of the provisions of Rule 310 and provide tools to assist construction workers in reducing fugitive dust.

The objectives of this project have been:

- To develop a standardized educational and outreach dust mitigation certification program for construction contractors and other stakeholders.
- To build upon educational outreach work already done by ADOT and Maricopa County.
- To solicit ideas from contractors, employees, and construction experts concerning the most feasible and effective dust mitigation practices and to investigate practices employed in other PM<sub>10</sub> nonattainment areas.
- To explore new forums for communicating the dust mitigation practices and certification program to a larger audience emulating Occupational Safety and Health Administration (OSHA) courses and utilizing audio/visual tapes and other electronic media including compact discs and Web sites.
- To create an effective outreach, training, and certification program targeting the construction industry in the Maricopa County Nonattainment Area.
- To develop a plan for implementing the program.
- To develop on-going measures of effectiveness for the program

### ***Background on Area Air Pollutants***

Although particulate matter, and particularly PM<sub>10</sub>, was the focus of the project, other air pollutants were also reviewed. Concentrations of carbon monoxide and ozone have periodically exceeded NAAQS standards, and mitigation efforts for these were also documented. High concentrations of any of these three pollutants pose significant health risks. However, as a result of tighter federal standards for new car emission controls, an enhanced vehicle emissions inspection program, and seasonal adjustments in fuel formulas, carbon monoxide and ozone concentrations have declined since the 1980s.

Most stringent control measures and best management practices for controlling fugitive dust were identified, and agency experience with various dust palliatives was documented.

### **Identification of Outreach Materials and Audiences**

As a guide in identifying effective outreach materials and methods, existing outreach and educational programs of selected regional agencies were reviewed and documented. Different outreach methods are effective with different audiences. Successfully developing an outreach program includes:

- Identifying the key elements of the message to be conveyed to the target audience
- Identifying constituencies that comprise the complete target audience: construction industry corporate management, job site management, and job site labor
- Persuading construction industry decision-makers to “take ownership” of the process
- Identifying appropriate approaches for specific construction industry circumstances

### ***Identifying the Appropriate Message***

Research conducted for MAG in developing the Serious Area Plan concluded that mitigation of fugitive dust from the following construction activities will reduce anticipated emissions by about 30 percent:

- Following the provisions of Rule 310 during construction earthmoving activities
- Following the provisions of Rule 310 to mitigate “trackout” from construction sites onto paved roads

The project team concluded that language based on Rule 310 provisions would need to be drafted to explain each concern in terms that are easily understood, provide realistic “rules of thumb” for determining when control measures are needed, and provide easy to follow directions for implementing the control measures

Outreach activity was categorized as “Information and Education - Initial,” “Information and Education - On-going,” and “Message Reinforcement.” The products or “collateral” associated with each activity are of three types:

- Text-based material - includes manuals, guide books, pocket guides, and posters
- Multimedia - includes cassette and video tapes, PowerPoint presentations, CDs, and Web-based outreach
- Reinforcement giveaways - includes collateral material such as pens, cups, clipboards designed to reinforce the message or steer persons to Web sites or guide books

### **Development of Program Components**

Following the review of dust control practices outreach efforts of other jurisdictions the Project Team developed a draft outreach program with input from the Technical Advisory Committee.

The prototype components developed are:

- Program name “Blue Skies Campaign” and accompanying logo
- Bilingual program brochure
- Bilingual Guide to Construction Dust Control Measures
- Bilingual Quick Reference Guide
- Fact Sheet Handouts
- Opacity Chart
- Dust Control Training Course and Certification Program

The bilingual program brochure and the bilingual *Guide to Construction Dust Control Measures* are designed to promote the Blue Skies program to prospective participants. The brochure contains a brief summary of the purpose and design of the training course, and the *Guide* provides a more in-depth view of the Blue Skies program.

The bilingual *Quick Reference Guide*, Fact Sheets, and Opacity Chart are designed as tools to be used by construction site labor and supervisory

personnel. Samples of topics discussed in the *Quick Reference Guide* include:

- What is Particulate Matter?
- The Dangers of Dust
- Maricopa County Rule 310
- Site Planning
- Ways of Controlling Trackout
- Effective Watering
- Wind Barriers
- Material Handling
- Visible Emissions and Opacity

Each of the briefings is designed to be used as the topic of a five minute “tool box” discussion conducted by the site supervisor before beginning the day’s work, or to be referred to throughout the day by any site employee. These topics are also covered on Fact Sheets designed to be widely distributed at job sites.

A prototype Opacity Chart designed to aid in estimating the opacity of dust plumes was developed based on the concept first introduced by 19<sup>th</sup> Century French theorist Maximilian Ringelmann that the darker a plume appears, the more opaque it is. The California Air Resources Board adapted this concept, originally intended to measure the opacity of smoke, to apply to the opacity of dust.

### **Dust Control Training Course and Certification Program**

Training modules have been developed for training construction personnel in understanding dust problems and dust control measures. Certified instructors to teach the courses would be certified by taking more intense training and completing “Smoke School” training to become a qualified observer in determining Plume Opacity.

The goal of the dust control training course is to train construction personnel in the understanding of dust problems and dust control measures for construction sites. Upon completion of the course the trainee will have the following skills:

- Basic understanding of dust problems and measures to mitigate dust at construction sites
- Ability to identify dust problems
- Ability to implement actions to reduce dust at construction sites

The course is designed for anyone working in the construction field, although site superintendents, water truck and water pull drivers, and

subcontractors are highly encouraged to attend. In addition to lectures, the course includes class discussion and review of actual field case studies.

#### ***Modular Lesson Plan***

A basic dust control course is designed to be presented in a half-day format. The course begins with a 10-minute video developed by the Maricopa County Environmental Services Department, entitled “Effective Dust Control and Overview of Rule 310.” The course typically includes five training modules, but can be tailored to the needs of specific groups by eliminating modules or part of modules. Summaries of the five training modules are presented below:

**Module 1 - Background** covers the reasons that dust control is needed, and the causes of PM<sub>10</sub>. Both natural and man-made sources of fugitive dust are identified and actions that have been taken to reduce PM<sub>10</sub> emissions are explained.

**Module 2 -Construction Dust Control Requirements** explores in detail the construction dust control requirements in effect for the jurisdiction in which the course is being presented. Dust control measures for construction-related activities are explained.

**Module 3 - Enforcement of Dust Control at Construction Sites** covers jurisdictional enforcement, including the characteristics of the dust control enforcement program, inspection criteria, enforcement procedures, and penalties for violations, as appropriate for the jurisdiction in which the course is being presented.

**Module 4 -Strategies to Assist Construction Activities in Controlling Dust** examines dust control strategies, including project design and site planning. A case study of a construction project will be included.

**Module 5 – Visible Emissions Evaluation at Construction Sites** describes the techniques used to identify the opacity levels of dust generated by construction activities. The script and slides for this module are being developed by the Arizona Department of Environmental Quality.

**Module 6 -Information Resources and Reinforcements** discusses additional information that supplements and reinforces the material covered in class. Participants are given a final exam that can be used for certification purposes.

Each of the modules has been structured as a PowerPoint presentation containing text, graphs, charts, and figures as training aids. An

accompanying *Dust Control Course Trainer's Guide* contains suggested step-by-step commentary for each module, as well as examples of a dust control log and earthmoving permit for reproduction and distribution to class attendees.

### **Certification Program**

The goal of the certification program is to establish minimum standards for mastering and teaching information on construction dust control problems and measures. The certification program is designed for construction industry management and job supervisory personnel. Two levels of certification are offered:

**Certified Dust Control Specialist** - An individual who completes Dust Control Training and passes an exam covering the subject matter presented in the course with a grade of 75 percent or better, may receive designation as a Certified Dust Control Specialist. To maintain certification, a Specialist must take the Dust Control Training and pass the final exam once every two years.

**Certified Dust Control Instructor** - A Certified Dust Control Specialist who has successfully completed Visible Emissions Evaluation Training and has co-taught a Dust Control Training course under the supervision of another Certified Instructor, may be designated as a Certified Dust Control Instructor. To maintain certification, an Instructor must receive Smoke School certification every six months and pass the final exam for Dust Control Training at least once a year.

The outreach coordinator will establish standards that must be met in order to receive Instructor Certification. The outreach coordinator would keep the instructors apprised of changes in the course material. Instructors would keep the outreach coordinator informed about classes being taught, attendance levels, and collateral materials required (i.e. toolkits and certification cards).

### **Implementing the Program**

The implementation of the outreach program consists of five major components:

- Establish Institutional Framework
- Finalize and Publish Collateral Material

- Initiate Outreach Campaign
- Establish Certification Program
- Continue Campaign/Training

Successful implementation of the PM<sub>10</sub> outreach program will require a strong institutional arrangement among the key agency and construction stakeholders. ADOT is a strong candidate for the lead agency to implement the PM<sub>10</sub> Outreach Program.

Potential sources of funding, personnel and other resources for the program include ADOT, Maricopa County, EPA, Western Regional Air Partnership, ADEQ, and Congestion Mitigation and Air Quality Improvement (CMAQ) funds received by the Maricopa Association of Governments.

Outreach Coordinator must be selected to manage the program and finalize the development and dissemination of collateral material, and a Workshop presentation or kick-off event should be held to initiate the training program.

Opportunities for linking the Blue Skies Program with other outreach programs having similar target audiences exist.

### **Measuring Program Effectiveness**

The outreach activities must be continuously monitored in order to determine the success of the program in educating the general public and construction industry as well as reducing dust at construction sites. A framework has been developed to measure the success of the outreach program. Elements of a strong performance measurement process would include the following step by step procedure.

1. Identify outreach goals
2. Identify and define measures of effectiveness to measure goals
3. Identify data sources
4. Develop mechanisms to collect data
5. Establish base line data for each measure
6. Tabulate and graph measures of effectiveness
7. Evaluate the performance of outreach program

The full report: *PM<sub>10</sub> Research for Developing Educational Tools and Outreach Programs* by Peter M. Lima, Robert H. Bohannon, and Cathy D. Arthur, of Phoenix, Arizona (Arizona Department of Transportation, report number FHWA-AZ-03-519, published October 2003) is available on the Internet. Educational and governmental agencies may order print copies from the Arizona Transportation Research Center, 206 S. 17 Ave., MD 075R, Phoenix, AZ 85007; FAX 602-712-3400. Businesses may order copies through ADOT's Engineering Records Section.